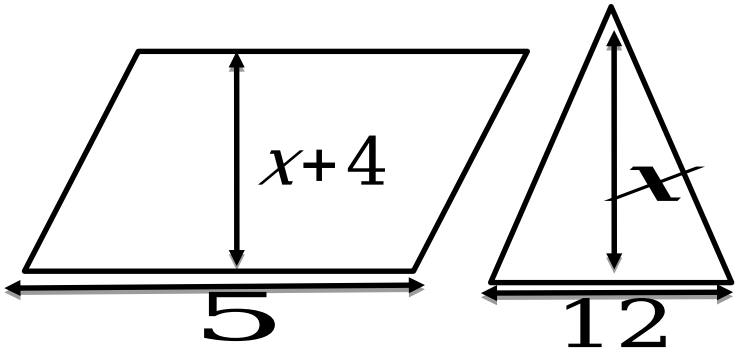
Equations (5) Simultaneous equations

1 $x+3=3x+$? $=2$

2 $x-2)=3+$? $=\frac{9}{2}$



3 The area of the triangle is 1 more than the area of the parallelogram. Determine

$5\square+$? $=6\square$

4 $\frac{1}{2}x+\frac{3}{4}(x-2)=\frac{1}{3}(2x-$? $\frac{6}{7}$

METHOD #1: Solving by Elimination

By either adding or subtracting the equations, we can ‘eliminate’ one of the variables.

$$2x+y=6 \quad 4x+y=6$$

Test Your Understanding

?

1

?

?

If you finish quickly:

?

Elimination by other means

[Kangaroo Grey 2013 Q6] The positive integers x,y and z satisfy

What is the value of $x+y+z$?

?

Exercise 2

1 Solve the following by elimination.

a

b

c

d

2 [IMC 2004 Q5] The sum of two numbers is 2. The difference between them is 4.

3 a

b

c

Two cats and a dog

and two dogs cost £159. How much does a cat cost?

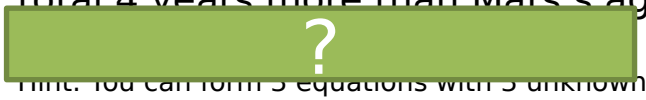
£23

4

5 Solve

6

N [Cayley 2004 Q2] Mars, his wife Venus and grandson Pluto have a combined age of 192. The ages of Mars and Pluto together total 30 years more than Venus' age. The ages of Venus and Pluto together total 4 years more than Mars's age.



Hint: You can form 3 equations with 3 unknowns

N **Mars = 94, Venus = 81, Pluto = 17**

[Cayley 2012 Q3] Three loaves of bread, five cartons of milk and four jars of jam cost £10.10. Five loaves

ns of milk and seven jars of jam cost £18.20. How much does it cost to buy one loaf of bread, one carton of milk and one jar of jam?

Solution: £2

Three methods of solving simultaneous equations

METHOD #3: Solving by Substitution

We currently have two equations both involving two variables.

Perhaps we could **put one equation in terms of or** , then **substitute this expression into the other**.

Why do you think we chose this equation to rearrange?

$$2\square+\square=7 \rightarrow \square=7$$

?

?

Check Your Understanding

Solve for and , using substitution.

Answer:

?

= 1

Answer:

?

Exercise 3

Use substitution only to solve the following simultaneous equations.

1 a

?

b

?

c

?

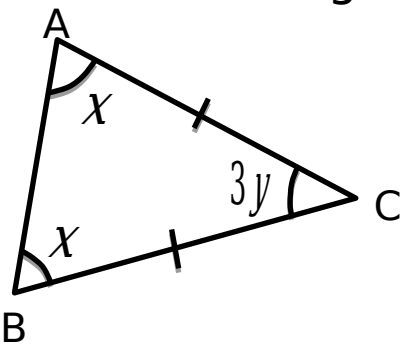
d

?

e

?

2



The angle at is 12° greater than the angle at . Find and .

?

3

Gus wants to buy 80 Ferraris, some **yellow** and some **red**. He must spend the whole of the £20m of his weekly pocket money. He buys **yellow** Ferraris at £40k and **red** Ferraris at £320k. How many Ferraris of each type did he buy?

?

4

£13 £19

£17

What is the cost of a

?

5

[Cayley] James, Alison and Vivek go into a shop to buy some sweets. James spends £1 on four Fudge Bars, a Sparkle and a Chomper. Alison spends 70p on three Chompers, two Fudge Bars and a Sparkle. Vivek spends 50p and a Fudge Bar. What is the cost of a Sparkle?

?

Sparkle = 15p

N_1

[Maclaurin] Solve the simultaneous equations:

?

(You must have proved algebraically, using substitution, that these are the only solutions)

N_2

[Maclaurin] Solve:

?

(Hint: If after ... p with a cubic equa... es factorise it b... o terms and the last two terms first separately)